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HELMINTHOLOGICAL ABSTRACTS

VOL. 18

18-19

incorporating
BIBLIOGRAPHY OF HELMINTHOLOGY
For the Year 1949



COMMONWEALTH BUREAU OF AGRICULTURAL PARASITOLOGY
(HELMINTHOLOGY)

Winches Farm Drive, Hatfield Road,
St. Albans, England.

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(HELMINTHOLOGY)

Winches Farm Drive, Hatfield Road,
St. Albans, England

October, 1949

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HELMINTHOLOGICAL ABSTRACTS *incorporating* BIBLIOGRAPHY OF HELMINTHOLOGY

Abstracts in the present number are by :

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T. Goodey	W. P. Rogers
Enid M. Smedley	

HELMINTHOLOGICAL ABSTRACTS

Vol. 18, Part 1

1949

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COMMONWEALTH AGRICULTURAL BUREAUX

JOINT PUBLICATION NO. 12

PHENOTHIAZINE 1942-46: A REVIEW AND BIBLIOGRAPHY

By J. Tweedale Edwards, M.R.C.V.S. and The Commonwealth Bureau
of Agricultural Parasitology (Helminthology)

November, 1947. Price 4s. od. post free

HELMINTHOLOGICAL ABSTRACTS

INCORPORATING BIBLIOGRAPHY OF HELMINTHOLOGY

FOR THE YEAR 1949

Vol. 18, Part 1

1—American Journal of Hygiene.

- a. GOULD, S. E. & KAASA, L. J., 1949.—“Low temperature treatment of pork. Effect of certain low temperatures on viability of trichina larvae.” 49 (1), 17–24.
- b. SADUN, E. H., 1949.—“The antibody basis of immunity in chickens to the nematode, *Ascaridia galli*.” 49 (1), 101–116.
- c. SADUN, E. H., 1949.—“The effect of single infections of variable size on the resistance of chickens to the nematode, *Ascaridia galli*.” 49 (1), 117–126.
- d. OLIVIER, L., 1949.—“The penetration of dermatitis-producing schistosome cercariae.” 49 (2), 134–139.
- e. NEWTON, W. L., BENNETT, H. J. & FIGGAT, W. B., 1949.—“Observations on the effects of various sewage treatment processes upon eggs of *Taenia saginata*.” 49 (2), 166–175.

(1a) Exposure to low temperatures is an effective means of destroying trichina larvae in pork. The lower the temperature the shorter is the time required for sterilization: for instance at -37°C . only two minutes is necessary while at -27°C . 36 hours is necessary. It is suggested that rapid freezing could be developed as an economic proposition. P.A.C.

(1b) Antibody formation occurs in chickens infested with *Ascaridia galli*. Antibodies cannot be demonstrated by the precipitin test but precipitates are formed round the mouth of living larvae *in vitro* and there appears to be a direct relation between the degree of resistance and the amount of reacting antibody. Older chickens appear to develop more antibodies than do young ones with similar infestations. Some protection can be given to chickens by the passive transfer of immune sera. P.A.C.

(1c) Massive doses of ova of *Ascaridia galli* do not necessarily result in large infestations of adult worms, for the percentage development of worms decreases as the size of the dose increases. The larvae penetrate the intestinal mucosa on the average 11.6 days after ingestion, the time when most fatalities occur. The lethal dose at various ages has been worked out. P.A.C.

(1d) Olivier has shown that the cercariae of *Trichobilharzia stagnicola*, the chief cause of schistosome dermatitis in man in the United States, can penetrate the skin while fully submerged and do not require an evaporating film of water to stimulate or aid penetration. Itching, associated with cercarial penetration of the skin, occurs within 4–10 minutes or more after the cercariae are applied to the skin. P.L.ler.

(1e) Newton et al. report on experiments conducted to evaluate the efficiency of primary sedimentation, anaerobic sludge digestion, sand filtration, the trickling filter and the activated sludge process in freeing sewage effluent of viable eggs of *Taenia saginata*. Their findings were that only sand filtration could be relied upon to eliminate the eggs of the tapeworm from contaminated sewage effluent. P.L.ler.

2—American Journal of Tropical Medicine.

- a. BARLOW, C. H. & MELENEY, H. E., 1949.—“A voluntary infection with *Schistosoma haematobium*.” 29 (1), 79–87.
- b. KENNEY, M. & HEWITT, R., 1949.—“Treatment of Bancroftian filariasis with hetrazan in British Guiana.” 29 (1), 89–114.
- c. SCHUBERT, M., GOLDBERG, E. & SCHREIBER, F. G., 1949.—“Comparison of several antimonials in the treatment of experimental schistosomiasis mansoni in mice.” 29 (1), 115–127.
- d. BRANNON, M. J. C. & FAUST, E. C., 1949.—“Preparation and testing of a specific antigen for diagnosis of human strongyloidiasis.” 29 (2), 229–239.

- e. WILLIAMS, W. J., SCHELLING, V. & HARTMAN, F. W., 1949.—“Action of some alkylhydroxybenzenes on pig ascaris *in vitro*.” 29 (2), 241–245.
- f. HITCHCOCK, D. J., 1949.—“Artifacts in transparent adhesive tapes used for perianal pinworm swabs.” 29 (2), 247–248.
- g. VAN DER KUIJP, E., 1949.—“Planorbidæ records of the Netherlands Antilles.” 29 (2), 259–261.

(2a) The chronology of a case of voluntary infection with *Schistosoma haematobium* is tabulated. A photograph illustrates the appearance of the skin lesions 24 hours after exposure to infection. From 3½ months onwards eggs appeared in the seminal fluid, faeces and urine, reaching a peak in the faeces at the end of the 6th month and in the urine between the 8th and 9th months. Eggs were discharged from lesions of the skin and adults were recovered from the adjacent subcutaneous tissues of the scrotum and groin early in the acute stage of the infection. Two courses of treatment with foudadin did not eradicate the infection. Urticaria occurred on the two days following the 2nd and 4th injections of tartar emetic. No eggs were recovered from the prostatic fluid obtained by rectal massage of the prostate. R.T.L.

(2b) Kenney & Hewitt report on the treatment of 296 cases of Bancroftian filariasis with Hetrazan in British Guiana. Symptomatic as well as asymptomatic cases amongst individuals of different races and ages were treated. They are optimistic about the value of this drug as a chemotherapeutic for the control of the disease and the elimination of associated undesirable sequelae. Dosage, action on the microfilariae and the adult worms, and the toxicity of the drug for man are discussed and conclusions drawn. P.L.ler.

(2c) Schubert et al. studied the therapeutic indices of ten antimony compounds in the treatment of experimental *Schistosoma mansoni* infections in mice. The therapeutic indices of sodium antimony tartrate, urea stibamine, neostibosan and neostam were below 1.0; those of foudadin and antimony trithiosorbitol were about 1.0, while three antimony trimercaptides and butyl antimony gallate showed indices of 2.0 to 3.0. They note that the degree of infection used caused a death rate which increased progressively with the age of the infection. P.L.ler.

(2d) An antigen prepared from filariform larvae of *Strongyloides fülleborni* from cultures of the faeces of *Pan satyrus*, extracted in isotonic salt solution or Coca's solution in dilution 1:100, gave positive intradermal reactions in 23 and positive precipitin reactions in 25 of 25 chronic human cases of *Strongyloides stercoralis* infection. The precipitin titres ranged from 1:5,000 to 1:30,000. R.T.L.

(2e) *In vitro* tests, using the variable exposure and the kymograph methods, were carried out with hexylresorcinol and 12 halogen-substituted hydroxybenzenes on *Ascaris lumbricoides* from pigs. The results are tabulated. These show that 2-ethyl-4-chloro-6-hexylresorcinol has a greater range of anthelmintic activity than, and a toxicity akin to that of hexylresorcinol; it is somewhat escharotic. R.T.L.

(2g) No autochthonous case of schistosomiasis has yet been reported from the Netherlands Leeward and Windward Islands, but the primitive sewage disposal methods and immigration from known endemic centres are potential sources of danger, as *Australorbis glabratus lugubris* now occurs in Curaçao, having been introduced from Venezuela in 1941. *Planorbis olivaceus*(?) was recorded in Dutch St. Martin by Emanuels between 1923 and 1927, but no indigenous case of schistosomiasis has been reported there although it occurs in Colombier in the French part of the island, and infected *P. olivaceus* have been collected there. R.T.L.

3—American Journal of Veterinary Research.

- a. OLSEN, O. W., 1949.—“Fasciolicidal efficacy of hexachloroethane-bentonite suspension in goats.” 10 (34), 71–73.
- b. BAILEY, W. S., 1949.—“Studies on calves experimentally infected with *Cooperia punctata* (v. Linstow, 1907) Ransom, 1907.” 10 (35), 119–129.

(3a) Critical tests on goats indicated that hexachlorethane-bentonite suspension in doses of 30 c.c. was highly effective in removing *Fasciola hepatica* unless there were extensive

pathological changes in the liver. Treatment of a flock of goats stopped mortality and resulted in marked physical improvement. R.T.L.

(3b) Bailey reports on the pathogenesis and histopathology of *Cooperia punctata* in experimentally infected calves. None of the animals developed anaemia. One animal showed symptoms of diarrhoea, anorexia, dehydration and progressive emaciation terminating in death. The macroscopic lesions, chiefly confined to the duodenum, were catarrhal enteritis accompanied by a fibrinonecrotic exudate, haemorrhages and a thickening of the intestinal wall. Microscopic examinations revealed leucocytic and serous infiltration of the intestinal wall, especially the submucosa. The worms were observed in contact with the mucosa, and in one case they had penetrated to the serosa. The failure to increase the worm load in already infected animals is attributed to the development of an active immunity stimulated by the previously administered larvae. In some animals the re-exposure to large numbers of larvae resulted in the expulsion of the previously established parasites. P.L.ler.

4—Anales del Instituto de Biología. Mexico.

- a. CABALLERO Y C., E., 1949.—"Estudios helmintológicos de la región oncocercosa de México y de la República de Guatemala. Nematoda, 4ª parte. Filarioidea III." Year 1948, 19 (1), 137-151.
- b. BRAVO H., M., 1949.—"Descripción de dos especies de tremátodos parásitos de *Bufo marinus* L. procedentes de Tuxtepec, Oaxaca." Year 1948, 19 (1), 153-161.
- c. ZERECERO Y D., M. C., 1949.—"Un tremátodo de la vejiga urinaria de *Kinosternon leucostomum* A. Dum., de la cuenca del Papaloapan, Ver." Year 1948, 19 (1), 163-168.

(4a) Caballero y C. continues his observations of some of the Filarioidea occurring in Guatemala. He records eight species, none of which however are new: they are *Dirofilaria immitis*, *Foleyella brachyoptera* (redescribed), *Ochoterenella digiticauda*, *Monopetalonema alcedinis*, *Setaria cervi* (redescribed), *Dipetalonema gracile*, *D. pricei*, and *Oswaldofilaria brevicaudata*. *Setaria nudicauda* is made a synonym of *S. cervi*, which is described from *Odocoileus nelsoni* as well as from cattle. P.A.C.

(4b) Bravo H. describes *Gorgoderina megalorchis* n.sp., a trematode parasite of the urinary bladder of *Bufo marinus* in Oaxaca. It can be distinguished from *G. attenuata*, the only other species of this genus in Mexico, by the size and relationships of the two suckers. She also emends the description of *Choledocystus intermedius* from *B. marinus*. P.A.C.

(4c) Zerecero y D. redescribes *Neopolystoma orbiculare* from the urinary bladder of *Kinosternon leucostomum* in Oaxaca. There are some slight differences from the original description in size and proportions which may be due to differences in technique. She also notices only 15 hooks on the genital disc. P.A.C.

5—Annals of Tropical Medicine and Parasitology.

- a. STANDEN, O. D., 1949.—"Experimental schistosomiasis. I.—The culture of the snail vectors *Planorbis boissyi* and *Bulinus truncatus*." 43 (1), 13-22.
- b. AZIM, M. A. & WATSON, J. M., 1949.—"Comparative efficiency of different methods of packing the snail vectors of *Schistosoma haematobium* and *S. mansoni* for transport by air." 43 (1), 39-40.
- c. WATSON, J. M. & AZIM, M. A., 1949.—"Comparative efficiency of various methods of infecting mice with *Schistosoma mansoni*." 43 (1), 41-46.
- d. KERSHAW, W. E., 1949.—"Observations on *Litomosoides carinii* (Travassos, 1919) Chandler, 1931. II.—The migration of the first-stage larva." 43 (1), 96-115.

(5a) Standen describes his technique of breeding and maintenance of *Planorbis boissyi* and *Bulinus truncatus* under laboratory conditions in London for the rearing of cercariae of *Schistosoma haematobium* and *S. mansoni*. He deals with the habits and bionomics of the snails in relation to their environment and comments on the ecology of the fauna in his aquaria. P.L.ler.

(5b) Azim & Watson record experiments for ascertaining the best method of packing *Bulinus truncatus* and *Planorbis boissyi* for transportation by air over long distances. Packing in damp mud covered with moist water plants in a perforated wooden box is considered superior to packing in fine silver sand "wetted to a pasty consistence", in finely ground wood charcoal mixed to a stiff paste with water, or in wet dead leaves in tubes 15 cm. long and 2 cm. in diameter of which the ends are covered with a double layer of gauze secured by adhesive paste. P.L.ler.

(5c) Watson & Azim record experiments which were designed to evaluate the efficiency of eight methods of infecting mice experimentally with *Schistosoma mansoni*. They claim that the most uniform level of infection was obtained by the partial immersion of the animals in "a known volume and depth of water containing a known number of cercariae". They observe that the mice must be induced to discharge stored excreta (faeces and urine) by standing them in water before exposing them to infection, because the excreta are lethal to cercariae. The next best method proved to be the cover-slip method. Subcutaneous and intraperitoneal injection methods failed to infect some animals, and few cercariae developed into adults. They failed to infect animals by the gastric injection method. P.L.ler.

(5d) Kershaw records experiments in which he tried to ascertain the time taken by the first-stage larvae of *Litomosoides carinii* to reach the peripheral circulation after discharge by the transplanted adult female. The time, though variable, was usually one day. Microfilariae continued to be present in the peripheral circulation for some days, weeks or even months after transfusion of infected blood. He stresses the importance of using large numbers of larvae to ensure their even distribution in the recipient host. P.L.ler.

6—British Medical Journal.

- a. KERSHAW, W. E., WILLIAMSON, J. & BERTRAM, D. S., 1949.—"Chemoprophylaxis of experimental filariasis in the cotton-rat." Year 1949, 1 (4594), 130-132.
- b. ANON., 1949.—"Prophylaxis of filariasis." [Annotation.] Year 1949, 1 (4594), 145.
- c. CAPLAN, J. P., 1949.—"Creeping eruption and intestinal strongyloidiasis." Year 1949, 1 (4600), 396.
- d. BRIDGES, W. G., 1949.—"Ocular filariasis." [Correspondence.] Year 1949, 1 (4602), 500.
- e. ANON., 1949.—"Pig as vector of Ascaris." [Questions & Answers.] Year 1949, 1 (4607), 735.

(6a) A single minimum dose of 250 mg. per kg. body-weight of "MSb" (p-melaminyl-phenyl stibonate) acts as a prophylactic agent for a maximum period of three weeks against the experimental establishment of *Litomosoides carinii* in the pleural cavity of the cotton-rat by exposure to infected mites. 500 mg. per kg. of antrypol and 50 mg. per kg. of stilbamidine were inactive at shorter intervals. R.T.L.

(6c) Several hundred cases of creeping eruption in ex-prisoners of war from Burma and Siam showed a tortuous or serpiginous linear urticarial weal usually beginning in close proximity to the anus and extending over the thighs, buttocks and chest, but not reaching the arms. Nearly all the cases had *Strongyloides stercoralis* infections. There was an eosinophilia of 10-25%. The skin irritation was relieved by the antihistamine group of drugs but anthelmintic treatment was unsuccessful against the intestinal strongyloidiasis. R.T.L.

(6d) Bridges describes a case in which Calabar swellings developed in Britain in a patient who had become infected with *Loa loa* in West Africa. An immature male *L. loa* was removed from the conjunctiva. After a course of stibamine glucoside the swellings became less frequent. R.T.L.

Bulletin de la Société de Pathologie Exotique.

- a. MAUZE, J., 1949.—"Filariose et tuberculose pulmonaire." 42 (1/2), 25-26. [Discussion pp. 26-28.]

- b. FLOCH, H. & CAMAIN, R., 1949.—"Sur un nouveau cas de pseudo-myiase rampante à *Ancylostoma brasiliense* en Guyane française." 42 (1/2), 29-33. [Discussion p. 33.]
- c. DECOURT, P., DUPOUX, R. & PELLOUX, A., 1949.—"Sur la toxicité des parasitocides et des molluscocides pour les vertébrés et les coefficients de sécurité nécessaires à leur emploi. (Première note)." 42 (1/2), 33-37. [Discussion pp. 37-38.]
- d. DESCHIEUS, R. & POIRIER, M., 1949.—"Anatomie pathologique de l'intoxication expérimentale subaiguë et chronique par les substances toxiques vermineuses." 42 (1/2), 70-75. [Discussion pp. 75-76.]
- e. COUTELEN, F., COCHET, G. & BIGUET, J., 1949.—"Présence d'*Hymenolepis nana* dans le Nord de la France." 42 (3/4), 106-111.
- f. COUDERT, J. & JUTTIN, P., 1949.—"A propos des méthodes d'enrichissement des selles." 42 (3/4), 111-114.
- g. BRAUN-BLANQUET, M., 1949.—"A propos de l'activité de l'essence de *Chenopodium ambrosioides*." 42 (3/4), 116-118.

(7b) [This article has previously appeared as *Publ. Inst. Pasteur Guyane*, No. 168 (1948). For abstract see *Helm. Abs.*, 17, No. 351a.]

(7c) A method is described whereby a "security coefficient" can be quickly and easily calculated for any rate of application of a parasiticide or molluscicide under various methods of application, by means of which the risk to man or animals drinking water contaminated with the substance or absorbing it through the skin can be judged. Substances whose security coefficient calculated on this basis is less than 1 for any given set of conditions should not be used, and those with a coefficient less than 10 must be used with caution. Security coefficients over 20 indicate a large safety margin. E.M.S.

(7d) Intramuscular injection of helminth extracts into guinea-pigs, rats and kittens has been shown to produce toxic lesions in the lungs, kidneys and liver, and progressive emaciation, with hyperleucocytosis and polynucleosis but usually without eosinophilia. *Taenia* extracts provoked congestive, irritative and oedematous, and rarely degenerative lesions. The moretoxic hydatid fluid precipitated inflammation often with degeneration and necrosis, and haemorrhage. *Parascaris equorum* extract, which is extremely toxic, produced simultaneous inflammation, degeneration and haemorrhage. Anaemia was a frequent but not constant feature; hyperleucocytosis was always seen. The lesions are largely analogous with those of subacute histamine intoxication in guinea-pigs. E.M.S.

(7e) In France *Hymenolepis nana* is rare in man. It has not hitherto been reported from the north but six indigenous cases are now recorded from the departments of the Nord and the Pas-de-Calais. R.T.L.

(7f) Telemann's method, as modified by Garin, is improved by shaking with separate successive additions of hydrochloric acid, toluene and ether. Slow and prolonged centrifugation increases the concentration of parasite material. R.T.L.

(7g) The anthelmintic activity of an extract of *Chenopodium ambrosioides* growing wild in the neighbourhood of Montpellier proved equal to that of oil of chenopodium imported from the U.S.A. Satisfactory results were obtained by its use against hookworm and *Ascaris lumbricoides* in man, and against *Dipylidium caninum* and *Toxocara canis* in the dog. R.T.L.

8—California Fish and Game.

- a. HERMAN, C. M., 1949.—"A new host for the eye worm *Thelazia californiensis*." 35 (2), 139.

(8a) Herman adds the coyote (*Canis latrans*) to the list of hosts of *Thelazia californiensis* published by him in *Calif. Fish Game*, 1944, 30 (1), 58-60. R.T.L.

9—Canadian Journal of Public Health.

- a. BROWN, M., CRONK, B., deSINNER, F., GREEN, J. E., GIBBONS, J. E. & KUITUNEN-EKBAUM, E., 1949.—“A note on trichinosis in animals of the Canadian Northwest Territories.” 40 (1), 20-21.
- b. MOYNIHAN, I. W. & MUSFELDT, I. W., 1949.—“A study of the incidence of trichinosis in rats of British Columbia.” [Abstract of paper presented at the 16th Annual Christmas Meeting of the Laboratory Section, Canadian Public Health Association, London, Ontario, December 13-14, 1948.] 40 (1), 38.

(9a) Examination of 6 seals (including specimens of *Erignathus barbatus*, *Phoca hispida* and *P. groenlandica*), 7 walruses, 9 white whales and 3 polar bears killed off Southampton Island, N.W.T., only revealed *Trichinella* infection in two of the polar bears. The danger of eating inadequately cooked polar bear flesh should be made known to parties travelling or at work in the North. For the Eskimos it constitutes a real problem owing to the shortage of fuel. R.T.L.

(9b) Preliminary results show a high rate of *Trichinella spiralis* infection in rats in the vicinity of Vancouver, B.C. The infection rate in 171 rats from four piggeries ranged from 22.9% to 46.5% in three piggeries; those from the fourth piggery were negative. Of 82 rats collected from five garbage dumps the infection rate was 7.6% to 20% from three dumps; the other two were negative. R.T.L.

10—Chronicle of the World Health Organization.

- a. ANON., 1949.—“Schistosomiasis.” 3 (3), 59-61.

(10a) This article briefly summarizes recent contributions by Shousha and by Meira in the *Bull. World Hlth. Org.* on the present position of schistosomiasis control in Egypt and in Brazil respectively. According to some estimates the bilharzial diseases affect nearly 150 million people and incapacitate many for work, causing considerable economic loss throughout the world. R.T.L.

11—Comptes Rendus des Séances de la Société de Biologie. Paris.

- a. PAUTRIZEL, R. & BAILINGER, J., 1949.—“Recherches sur l'hémotoxine ascaridienne.” Year 1948, 142 (23/24), 1550.
- b. PAUTRIZEL, R. & MAYER, G., 1949.—“Les manifestations cutanées provoquées chez le cobaye par injections intradermiques d'extraits vermineux.” Year 1948, 142 (23/24), 1551-1552.
- c. PAUTRIZEL, R. & MAYER, G., 1949.—“Action d'un antihistaminique de synthèse sur les manifestations cutanées chez le cobaye par l'injection intradermique d'extraits ascaridiens.” Year 1948, 142 (23/24), 1552-1553.
- d. DESCHIENS, R. & POIRIER, M., 1949.—“Les altérations spléniques et sanguines dans l'intoxication expérimentale du cobaye par le liquide hydatique.” 143 (1/2), 25-26.

(11a) Pautrizel & Bailinger show that extracts of *Ascaris lumbricoides* are not haemolytic in themselves. Haemolysis is caused by the presence of *Proteus*. P.A.C.

(11b) Intradermal injection of extracts of ascarids into guinea-pigs is followed by local infiltrations of large numbers of leucocytes. In animals previously sensitized the infiltration is mainly eosinophilic but this does not happen when sensitized animals are given injections of *Moniezia expansa* extract. P.A.C.

(11c) Pautrizel & Mayer have given to guinea-pigs previously sensitized to extracts of *Ascaris* large subcutaneous injections of an antihistamine substance designated 3277 R.P., which is the compound *n*-dimethyl-amino-2-propyl-1-thiodiphenylamine. This had the effect of reducing the intensity of the histamine reaction as judged by the extent of the leucocyte infiltration. P.A.C.

(11d) Hydatid intoxication in the guinea-pig is always accompanied by certain blood changes: anisocytosis and polychromatophilia are well marked, while the haemoglobin

index may fall as low as 55% without any marked decrease of the erythrocyte count. There is an increase in the number of neutrophils, and of eosinophiles both feebly in the circulating blood and more markedly in the bone-marrow. The spleen is enlarged with reticular hyperplasia and degenerative changes together with a tendency towards haemorrhage.

P.A.C.

2—Documenta Neerlandica et Indonesica de Morbis Tropicis.

- a. LIE KIAN JOE, 1949.—"Helminthiasis of the intestinal wall caused by *Oesophagostomum apiostomum* (Willach, 1891) Railliet and Henry, 1905." 1 (1), 75-80.
- b. GAN, K. H., 1949.—"Research on the life history of *Diphylobothrium ranarum*." 1 (1), 90-92.

(12a) Ten nodules, 0.7-1.0 cm. in diameter, containing *Oesophagostomum apiostomum* living in greenish-brown pus, were found post mortem in the submucosa of the caecum and ascending colon of an Indonesian in Batavia. The morphology of the worms and the histology of the cysts are described and figured. Brief mention is made of the occasional occurrence of circumscribed haemorrhages of the submucosa of the small intestine due to invasion of the intestinal wall by adult *Ancylostoma duodenale*.

R.T.L.

(12b) At Batavia a *Diphylobothrium* infection occurs as a natural infection in cats. Local frogs (*Rana cancrivora*) and toads (*Bufo melanostictus*) harbour spargana which develop into adult *D. ranarum* when fed experimentally to cats and dogs. The first intermediary is a common species of *Cyclops*. Mice, a guinea-pig and a monkey developed spargana when infected by oral or intramuscular-intraperitoneal infection with infected *Cyclops*. The spargana from mice and monkeys became adult *D. ranarum* when fed to cats. Tadpoles acquire infection from infected *Cyclops* much more readily than adult frogs and toads.

R.T.L.

3—East African Agricultural Journal.

- a. DUTHY, B. L. & LEWIS, R. W. E., 1949.—"A warning. Eye trouble attributable to photosensitization following the use of phenothiazine in bovines." 14 (3), 155-156.

(13a) Keratitis in cattle following treatment with phenothiazine is reported for the first time in Kenya. It may be prevented by keeping the animals in the shade for 24 hours after dosing.

R.T.L.

4—Empire Journal of Experimental Agriculture.

- a. THOMPSON, H. W., 1949.—"The potato-root eelworm (*Heterodera rostochiensis* Woll.) in the United Kingdom." 17 (65), 60-71.

(14a) Thompson outlines the history and distribution of potato root eelworm disease in potatoes and tomatoes in the United Kingdom. He mentions chilling of the seed potato, mineral deficiencies and other adverse factors which may, in the presence of relatively slight eelworm attack, cause fairly severe symptoms. He also considers the means of spread of the eelworm and the influence of soil type on the production of disease. Attempts to control the eelworm disease are reviewed, including manurial, chemical and biological methods. Finally, since none of these has yet proved practicable, Thompson describes methods of field sampling for estimating the eelworm population, gives some data on the build-up and persistence of infestation in Yorkshire, and indicates how cropping programmes can be based on such surveys.

M.T.F.

5—Farming in South Africa.

- a. DE KOCK, G., 1949.—"The health of the Union's livestock." [Report of the Division of Veterinary Services for the year ended 30th June 1948.] 24 (275), 65-78, 121, 153.

(15a) A restudy of the morphology of various paramphistomes tends to show that only three species occur in ruminant stock in the Union of South Africa, viz., *Paramphistomum cervi*, *P. explanatum* and *Cotylophoron cotylophorum*. The last-named species is relatively scarce and confined to Natal.

R.T.L.

16—Fauna och Flora. Uppsala.

- a. BACKLUND, H. O., 1949.—“En kommensal som äter sitt värddjurs parasiter.” 44 (1), 38–41.

(16a) *Chaetogaster limnaei*, a predaceous annelid which lives in the mantle-cavity of snails, was very common in *Limnaea* spp. collected at Kungsmarken outside Lund in early October, 1948; up to 10 specimens per snail were found. In the laboratory they were seen to have the gut full of cercariae, sometimes 25 or more. Backlund postulates that in nature where the emergence of cercariae is intermittent and less rapid this rich food supply may be a factor in the sexual maturity of *Chaetogaster* which occurs in late autumn. He also supports Wagin's hypothesis that *Chaetogaster* may under these circumstances be an important factor in controlling the numbers of flukes. E.M.S.

17—Indian Medical Gazette.

- a. CHAUDHURI, R. N., 1949.—“Notes on some remedies. XXVI.—Drugs in helminthic diseases. Part I.” 84 (2), 55–56.
 b. AYYAR, S. R., 1949.—“Treatment of filariasis by lithium antimony thiomalate.” 84 (3), 100–102.
 c. CHAUDHURI, R. N., 1949.—“Notes on some remedies. XXVII.—Drugs in helminthic diseases, Part II.” 84 (3), 105–106.

(17a) These notes briefly summarize the uses and limitations of santonin, oil of chenopodium, carbon tetrachloride and tetrachlorethylene as anthelmintics. R.T.L.

(17b) Clinical records of nine cases of filariasis bancrofti treated in the Madras Presidency with lithium antimony thiomalate gave encouraging results in the early cases only. R.T.L.

(17c) Chaudhuri continues his short notes on anthelmintics. This second part deals with hexylresorcinol, gentian violet, phenothiazine, diphenan, male fern, antimony compounds and Hetrazan. A table gives the dosage, method of administration, use and remarks on the anthelmintics in parts I and II [see also No. 17a above]. R.T.L.

18—Indian Veterinary Journal.

- a. D'SOUZA, B. A., 1949.—“Observations on the outbreak of the so-called obscure sheep disease at the Livestock Research Station, Hosur, in 1946–47.” 25 (5), 321–330.
 b. KRISHNAMURTY, D., 1949.—“*Cysticercus cellulosae*. Their incidence in canines.” 25 (5), 367–370.

(18a) A fatal enteritis with intermaxillary oedema and diarrhoea in sheep, cattle and buffaloes at Hosur is attributed to acute catarrh of the pyloric portion of the abomasum and duodenum, resulting from invasion of the mucosa with immature amphistomes identified as *Cotylophoron cotylophorum* and *Gastrothylax crumenifer*. The period of incubation was approximately 50–60 days. R.T.L.

(18b) *Cysticercus cellulosae* was found in seven out of 500 dogs autopsied in Madras Veterinary College Hospital. In all cases, the cysts occurred in the brain but in five only there were cerebral symptoms. In four there were also cysts in the myocardium and skeletal musculature. R.T.L.

19—Journal of the American Medical Association.

- a. OLIVER-GONZÁLEZ, J., SANTIAGO-STEVENSON, D. & MALDONADO, J. F., 1949.—“Treatment of filariasis bancrofti with hetrazan®. Follow-up observations fifteen months after treatment.” 139 (5), 308–309.

(19a) Observations made 15 months after the administration of Hetrazan to 23 persons with microfilariæ of *Wuchereria bancrofti* [see Helm. Abs., 16, No. 242a] showed that the blood was still free from microfilariæ in 13, while in 10 the low count at the end of the period of treatment remained unchanged. There was no evidence of residual lymphatic disease attributable to the filaricidal action of the drug. R.T.L.

20—Journal of the American Veterinary Medical Association.

- a. EGEHOJ, J., 1949.—“Distomiasis in Danish cattle.” 114 (864), 130.

(20a) Liver-fluke occurred in 10.86% of the 21,509 cattle slaughtered at the public slaughterhouse of Graasten in Denmark, between 1943 and 1947. Of the infected livers 84.52% were condemned as unfit for human consumption. The economic loss was estimated at 31,940.87 Danish kroner apart from the lower value of the carcasses. Cattle from the southern part of Jutland appeared to be more frequently infected than those from other parts of the peninsula. R.T.L.

21—Journal of the Department of Agriculture. Victoria.

- a. ANON., 1949.—“Bulb eelworm.” 47 (2), 88–89.

22—Journal of Experimental Medicine.

- a. BUEDING, E., 1949.—“Studies on the metabolism of the filarial worm, *Litomosoides carinii*.” 89 (1), 107–130.

(22a) Oxidative metabolism is essential to *Litomosoides carinii*. The main end-product of anaerobic carbohydrate metabolism is lactic acid whereas, according to Von Brand, in other worms this results predominantly in valeric, formic, acetic, butyric and non-volatile higher fatty acids. The cyanine dyes in low concentration inhibit the oxygen uptake of this species and this is associated with a compensatory increase in aerobic glycolysis and with decreased rates of acetate production and of polysaccharide synthesis. The chemotherapeutic activity of the cyanine dyes in filariasis of the cotton-rat is due to their inhibitory effect on the respiratory metabolism of *L. carinii*. R.T.L.

23—Journal of Investigative Dermatology.

- a. VAN DE ERVE, Jr., J., 1949.—“Creeping eruption, systemic therapy.” 12 (1), 69–79.

(23a) Brief clinical records are given of 19 cases of creeping eruption due to larvae of *Ancylostoma braziliense*. Hetrazan given in doses of 2 mg. per kg. body-weight in tablet form, three times daily for 3 to 20 days, effected a cure in 13 out of the 17 cases which completed the course of treatment. R.T.L.

24—Journal of the Ministry of Agriculture. London.

- a. REID, R. D., 1949.—“Breeding strawberries for disease resistance.” 55 (11), 476–482.
b. PETERS, B. G., 1949.—“The potato root eelworm problem.” 55 (11), 493–498.
c. WATSON, J. A. S., 1949.—“Old farming beliefs in the light of science.” 55 (12), 507–512.

(24a) In the course of breeding work designed to develop strawberry varieties resistant to fungal root-rot, Reid has encountered both virus disease and “spring dwarf” symptoms associated with the bud eelworm *Aphelenchoides fragariae*. He gives a short account of the symptoms due to the eelworm and the way in which it is spread. M.T.F.

(24b) The increased area of land under potatoes and their frequent recurrence in the rotation, during and since the war, have intensified the potato root eelworm problem in Britain. Peters briefly reviews the present position of this problem. B.G.P.

(24c) Prior to the introduction of carbon tetrachloride and extract of male fern for the treatment of liver-fluke, affected animals were treated with common salt. It is suggested that this idea arose from early observation that sheep grazed on salt marshes were free from infection. It is suggested that this freedom from infection was due to the absence of *Limnaea truncatula* in salt marshes and not to any specific action of salt as a cure. R.T.L.

25—Journal of Parasitology.

- a. FAUST, E. C., 1949.—"Reflections of a medical parasitologist." 35 (1), 1-7.
- b. BRACKETT, S. & BLIZNICK, A., 1949.—"Screening large numbers of new chemical compounds for anthelmintic activity using infections with *Nippostrongylus muris* in mice." 35 (1), 8-18.
- c. GURSCH, O. F., 1949.—"Intestinal phase of *Trichinella spiralis* (Owen, 1835) Railliet, 1895." 35 (1), 19-26.
- d. RIEDEL, B. B., 1949.—"Milk as a source of some protection against the acquisition of *Trichinella spiralis* in mice." 35 (1), 27-30.
- e. SAUNDERS, L. G., 1949.—"A survey of helminth and protozoan incidence in man and dogs at Fort Chipewyan, Alberta." 35 (1), 31-34.
- f. BRACKETT, S. & BLIZNICK, A., 1949.—"An attempt to adapt *Strongyloides ratti* to the mouse." 35 (1), 41-44.
- g. LARSH, Jr., J. E. & KENT, D. E., 1949.—"The effect of alcohol on natural and acquired immunity of mice to infection with *Trichinella spiralis*." 35 (1), 45-53.
- h. MARTIN, W. E. & GEE, D., 1949.—"A new species of *Eurytrema* (Trematoda: Dicrocoeliidae) from the slate-colored junco." 35 (1), 61-66.
- i. RAUSCH, R., 1949.—"Some additional observations on the morphology of *Dendrostrongylus botauri* Rausch, 1948 (Cestoda: Dilepididae)." 35 (1), 76-78.
- j. WEBSTER, J. D., 1949.—"Fragmentary studies on the life history of the cestode *Mesocostoides latus*." 35 (1), 83-90.
- k. SCHREIBER, F. G. & SCHUBERT, M., 1949.—"Experimental infection of the snail *Australorbis glabratus* with the trematode *Schistosoma mansoni* and the production of cercariae." 35 (1), 91-100.
- l. LARSH, Jr., J. E. & HENDRICKS, J. R., 1949.—"The probable explanation for the difference in the localization of adult *Trichinella spiralis* in young and old mice." 35 (1), 101-106.
- m. DAENGSVANG, S., 1949.—"Human gnathostomiasis in Siam with reference to the methods of prevention." 35 (2), 116-121.
- n. BEAVER, P. C., 1949.—"Quantitative hookworm diagnosis by direct smear." 35 (2), 125-135.
- o. NEGhme, A., 1949.—"Present status of trichinosis in Santiago, Chile." 35 (2), 136-137.
- p. SCHÜFFNER, W. & SWELLENGREBEL, N. H., 1949.—"Retrofection in oxyuriasis. A newly discovered mode of infection with *Enterobius vermicularis*." 35 (2), 138-146.
- q. INGALLS, Jr., J. W., HUNTER, III, G. W., McMULLEN, D. B. & BAUMAN, P. M., 1949.—"The molluscan intermediate host and schistosomiasis japonica. I. Observations on the conditions governing the hatching of the eggs of *Schistosoma japonicum*." 35 (2), 147-151.
- r. MOORE, D. V., YOLLES, T. K. & MELENEY, H. E., 1949.—"A comparison of common laboratory animals as experimental hosts for *Schistosoma mansoni*." 35 (2), 156-170.
- s. ELLIOTT, A. M. & RUSSERT, L. R., 1949.—"Some condition characteristics of a yellow perch population heavily parasitized by *Clinostomum marginatum*." 35 (2), 183-190.
- t. FISCHTHAL, J. H., 1949.—"The over-wintering of black grubs and yellow grubs in fish." 35 (2), 191-192.
- u. BARLOW, C. H., 1949.—"A theory of egg-deposition by *Bilharzia haematobia*." 35 (2), 205-207.
- v. HITCHCOCK, D. J., 1949.—"Penetration characteristics of *Schistosoma mansoni* cercariae." 35 (2), 216-217.
- w. EDGAR, S. A., 1949.—"*Capillaria annulata* (Molin, 1858) from the mucosa of the mouth of the domestic fowl, *Gallus domesticus* (Linn.)." 35 (2), 218.
- x. LINCICOME, D. R., 1949.—"Additional record of the occurrence of the acanthocephalan *Eocollis arcanus* Van Cleave." 35 (2), 218.
- y. MANter, H. W., 1949.—"On the status of *Pleorchis mollis* (Leidy, 1856) Stiles, 1894 (Trematoda)." 35 (2), 220-221.
- z. MANter, H. W., 1949.—"The trematode *Cathaemasia pulchrosoma* (Travassos, 1916) n. comb. from the body cavity of a kingfisher (*Megaceryle alcyon*) in Nebraska." 35 (2), 221.

(25a) Faust's presidential address to the American Society of Parasitologists, 1948, deals with the qualifications, training and functions, and outside interests of medical parasitologists.

R.T.L.

(25b) Out of more than 1,500 compounds tested for anthelmintic action against *Nippostrongylus muris* in young mice, trichloracetamide and some related compounds alone proved effective. Trichloracetamide proved most effective against developing worms and almost completely ineffective against the mature worms. It prevented infection but did not eradicate established infections. It had no action against *Strongyloides ratti*, *Trichinella spiralis*, *Litomosoides carinii*, *Hymenolepis nana*, oxyurids or *Schistosoma mansoni* in laboratory rodents.

R.T.L.

(25c) Experimental infection of rats with *Trichinella spiralis* showed that between the 1st and the 9th day the number of adults in the intestine remained stabilized. Thereafter a rapid loss occurred and by the 15th day adults had completely disappeared. The greatest numbers of adults were found in the first quarter of the small intestine, but throughout the infection worms at the same stage of development were also found in the stomach, caecum and large intestine. Most of the worms had penetrated into the mucous membrane within 4 hours after infection, but after 20 hours most of them were again in the intestinal lumen. After two days the worms, both male and female, had repenetrated the mucosa where they caused considerable destruction of the villi. The sex ratio two days after infection was two females to one male.

R.T.L.

(25d) Although the average number of adult *Trichinella spiralis* found in experimentally infected mice fed on a commercial ration to which whole milk had been added was about the same as in those in which the supplement was water, the number of larvae harboured 28 days after infection was less with the milk supplement.

R.T.L.

(25e) A helminth survey at Fort Chipewyan, which is approximately 370 miles north of Edmonton, Alberta, showed that 16 out of 140 persons harboured *Diphyllbothrium latum*. No instance of anaemia was met with. No eggs of *Ascaris*, *Enterobius* or Trematoda were found during faecal examinations, but there was clinical evidence of pinworm as many persons of all ages reported anal pruritus and sleeplessness. *D. latum* occurred in 38 out of 88 dogs (47.5%) but in most of these there were few eggs in the faeces. *Ancylostoma caninum* eggs were present in 10 dogs and "other nematode eggs" occurred sparingly.

R.T.L.

(25f) *Strongyloides ratti* failed to increase its adaptability to mice after 19 passages. Only about 6% of the larvae inoculated into Vanderwerken mice developed to maturity.

R.T.L.

(25g) Experiments are described in which alcohol had no effect on the natural resistance of mice to infection with *Trichinella spiralis*. By using repeated stimulating infections, however, it was possible to show that alcohol had a striking effect on the immune response.

R.T.L.

(25h) *Eurytrema alveyi* n.sp. is described from *Junco h. hiemalis*, in Indiana, U.S.A. It resembles *E. ludoviciana* but the cirrus does not overlap the acetabulum, the genital pore is placed more anteriorly, the yolk glands are more extensive and the eggs are considerably smaller, averaging 0.031×0.02 mm.

R.T.L.

(25i) Previous descriptions of species of *Dendroterina* were based on materials lacking a scolex. The scolex of *D. botauri* is well developed, about 165μ in diameter, with a short rostellum carrying 2 rows of hooks, 18 in number. This genus is retained in the family Dipilidae.

R.T.L.

(25j) Attempts to ascertain the first intermediate host of *Mesocostoides latus* from *Didelphis virginianus* have failed. The "*Cysticercus* sp." reported by Harwood (1932) is an immature tetrathyridium of *M. variabilis*. Over 50 tetrathyridia collected by Webster from *Peromyscus b. boylii* are provisionally identified as larvae of *M. variabilis* or *M. kirbyi*.

R.T.L.

(25k) Exposure under specified laboratory conditions of *Australorbis glabratus* to 5-7 *Schistosoma mansoni* miracidia resulted in 50-60% infection whereas exposure to one miracidium per snail gave only 8% successful results. 50% of miracidia died in about 8 hours. 50% of cercariae in suspensions of 150 per ml. at 30°C. died within 8 to 16 hours and all were dead in 20 hours. Stimulation by heat and light of snails infected with 5-7 miracidia resulted in the liberation of a daily average of 700 cercariae; after two days rest this increased to 1,200.

R.T.L.

(25l) That adult *Trichinella spiralis* are located in significantly greater numbers in the posterior half of the small intestine in young mice while the reverse is the case in old mice, is explained as due chiefly to the difference in the emptying time of the intestine. No age resistance was evident in the experimental animals. R.T.L.

(25m) Seventeen new cases of *Gnathostoma spinigerum* in man are added to the 17 instances already reported from Siam. The symptoms noted were chiefly migratory, intermittent swellings of the skin and mucous membranes, boring or prickling pain and itching, and symptoms due to injury of the affected organs, e.g. haematuria, leucorrhoea, meningeal irritation, disturbance of vision, ecchymosis of the eye, pleurisy. The life-cycle requires two intermediaries, a cyclops and a fresh-water fish or fresh-water snake. In Siam fermented food mainly made from raw fish, especially *Ophicephalus striatus*, contained living infective gnathostome larvae and these produced adults when fed to cats. Thorough cooking of any fresh-water fish is the only sure preventive. R.T.L.

(25n) A direct smear count is as reliable as a dilution count in estimating the intensity of a hookworm infection. It requires no correction for consistency or size of stool. The direct faecal smear can be standardized by using a photoelectric foot-candle meter. Standard direct smear counts can be interpreted roughly in terms of eggs per c.c. by using a conversion factor of 300, and in terms of *Necator* burden by multiplying the number of eggs by 10. R.T.L.

(25o) No less than 50 cases of trichinelliasis occur annually in the Chilean province of Santiago but most of them are benign. In 1947, 422 out of 470 persons at the Santiago Military School were affected; of these 351 showed clinical symptoms. There were no fatalities. In addition, 157 clinically acute cases occurred in the city between July and October. The incidence of *Trichinella* infection in the pigs killed at the municipal slaughter house ranged from 0.2-0.3%, and 8% of 200 rats trapped there were found to be infected. R.T.L.

(25p) Although *Enterobius vermicularis* eggs occur in large numbers in room dust, relatively few of these actually produce infection, yet in schools it is rare for a child to escape. Graphs show the course of (i) typical anus-to-mouth transmission and its partial control effected by mechanical prophylaxis; (ii) indirect or contact infection from contamination of the fingers, and from thence the food, of hitherto uninfected persons—this type is rarely seen and self-cure occurs in adults, but in children anus-to-mouth infection prolongs the course; (iii) dust-borne infection, which is usually light; (iv) a hitherto unrecognized type called retroinfection due to larvae hatching and crawling into the bowel from the anus. This route was experimentally studied on two medical volunteers. The larvae used were hatched in artificial gastric juice and applied to the anal sphincter. Age apparently does not protect from retroinfection. Such infection ends spontaneously provided the eggs are removed from the anal region every six hours. R.T.L.

(25q) The rate of hatching of *Schistosoma japonicum* eggs is not affected by the degree of intensity of illumination, agitation of the faecal matter in suspension, or osmotic stimuli. There is no diurnal or nocturnal cycle of frequency in hatching rates. The best yields of miracidia were obtained in water with pH 7.6. The water should be clean and alkaline and the faecal material thoroughly washed. After hatching has ceased further hatchings can be induced by re-sedimenting the material. R.T.L.

(25r) That mice and hamsters are the most suitable laboratory animals as hosts for experimental infections with *Schistosoma mansoni* is confirmed. The prepatent period is 5-6 weeks. There is no significant difference in the percentage of worms recovered from mice after intraperitoneal and percutaneous infections. Guinea-pigs, rats and rabbits are unsatisfactory as the eggs are not passed in the faeces and few, if any, worms result from intraperitoneal injections. After cutaneous exposure of guinea-pigs and rabbits large numbers

of worms can be obtained in 12 weeks for antigen and serological studies, although the mature worms are small and the pathological changes are never as extensive as in mice and hamsters. The rat is the poorest host: some are refractory and the worms remain in the intra-hepatic circulation, very few developing to maturity. R.T.L.

(25s) No correlation between the number of *Clinostomum marginatum* and the coefficient of condition was observed in a population of about 2,200 perch. Within each age group the coefficient of condition is lowest in fish of intermediate size. The average number of parasites increases with age and size with arithmetic regularity. R.T.L.

(25t) Thirty fish of four species, all infested with "yellow grub" (*Clinostomum marginatum* metacercariae) and 14 of them with "black grub" (*Neascus* spp. metacercariae), were tagged and their skin cysts counted and individually recorded on outline drawings in October 1944. Six months later the fish were removed from the hatchery raceway where they had been maintained during the experiment, and it was found that of 200 *Neascus* cysts originally present only six (3%), and of 324 *Clinostomum* cysts only 14 (4.3%) had been lost. Fischthal concludes that the local fishermen's claim that the fish taken in winter are free of "grubs" is exaggerated and is due probably to fish being taken in winter from deeper water where the infestation is normally lower. E.M.S.

(25u) Barlow cites clinical evidence in support of his theory that the progress of the eggs of *Schistosoma haematobium* from the worms to the bladder, their development within the body and their final escape in the urine is accompanied by a process of histolysis, and that the female by force or histolysis pushes through the vein wall making a pocket or cyst into which the eggs are discharged. Here the ovum becomes a miracidium which exudes a histolytic substance through the shell. The cyst wall and mucosa of the bladder are histolysed and the eggs escape into the bladder *en masse* during micturition. After the bladder is emptied clot formation occurs at the site of the rupture and the cyst is refilled with eggs by the worm. It is pointed out that the uniform number of eggs at the same developmental maturity which appear in daily micturition is evidence against the view that the progress of the eggs through the tissues is fortuitous. R.T.L.

(25v) *Schistosoma mansoni* cercariae placed on the clipped skin of the abdomen of hamsters, relaxed with nembutal, disappeared below the skin in 2-15 minutes with an average of 4.3 minutes. On the ears of laboratory white mice they penetrated in 2.5-8 minutes with an average of 3.6 minutes. The cercariae crawled along the skin and at the commencement of penetration were perpendicular to the skin and attached by the oral sucker. R.T.L.

(25w) *Capillaria annulata* is reported now from the mucosa of the floor of the mouth of three adult fowls. This may explain why infected birds refuse grain and only accept soft food. R.T.L.

(25x) Lincicome has collected immature specimens of *Eocollis arcanus* from *Pomoxis nigro-maculatus* and *P. annularis* at Havana, Illinois. R.T.L.

(25y) The genus *Pleorchis* contains three species: *P. polyorchis* (type species), *P. sciaenae* and *P. americanus*. The last-named, of which *P. lintoni* Yamaguti, 1938 and *P. mollis* (Leidy, 1856) Stiles, 1896 are synonyms, has an involved history which is summarized. The original *Monostomum molle* Leidy, 1856 was probably *Heronimus chelydrae*. R.T.L.

(25z) As no generic differences distinguish *Pulchrosoma* Travassos, 1916 from *Cathaemasia* Looss, 1899, *P. pulchrosoma* Travassos, 1916 becomes *Cathaemasia pulchrosoma*. It is pointed out that *Pulchrosoma* is listed among the Nematoda in Nomenclator Zoologicus and in the Zoological Record for 1916; but is again listed correctly as a trematode in the Zoological Record for 1926. R.T.L.

26—Journal of Tropical Medicine and Hygiene.

- a. ANON., 1949.—"The specific treatment of filariasis." [Annotation.] 52 (1), 1.
- b. GELFAND, M. & ROSS, W. F., 1949.—"The diagnosis of schistosomiasis by rectal and vesical snips based on 150 autopsies." 52 (1), 12-15.
- c. NAPIER, L. E., 1949.—"*Strongyloides stercoralis* infection. Part I." 52 (2), 25-30.
- d. ROBERTS, J. I., 1949.—"A parasitological survey of African school children in Nairobi schools with haematological results of malarial infections." 52 (2), 31-33.
- e. NAPIER, L. E., 1949.—"*Strongyloides stercoralis* infection. Part II.—Strongyloidiasis among ex-prisoners-of-war." 52 (3), 46-48.
- f. ROBERTS, J. I., 1949.—"A protozoological and helminthological survey of three races in Nairobi, Kenya." 52 (3), 49-59.
- g. DEWHURST, K. E., 1949.—"The tribal distribution of *Bilharzia* in East Africa." 52 (3), 60-61.

(26b) A comparative study of the efficiency of rectal or vesical biopsy and of rectal or vesical digestion techniques for the diagnosis of schistosome infections was made on bladders and rectums obtained post mortem from 150 cases. The results confirmed the value of vesical snips in the diagnosis of *S. haematobium* infections and showed that *S. haematobium* infections can often be recognized from rectal snips, although the eggs are seldom found in the faeces. Pure infections with *S. mansoni* were extremely uncommon in South Central Africa. R.T.L.

(26c) In Napier's experience, infections with *Strongyloides stercoralis* cannot be taken lightly. In a large number of European tea planters and ex-prisoners of war in Burma, India and the Far East, ill-defined abdominal symptoms usually attributed to amoebiasis persisted as long as *Strongyloides* infection remained. The geographical distribution, aetiology, life-cycles, pathology, symptomatology and prognosis are discussed. No striking success resulted from treatment with gentian violet, antimony compounds or Hetrazan. R.T.L.

(26d) The incidence of helminth infections in African schoolchildren in Nairobi is tabulated. 45% of the stools of those examined once were positive for helminth eggs, and 75% were positive after two examinations. R.T.L.

(26e) Napier estimates that between 25% and 100% of the prisoners-of-war used by the Japanese on railway construction in Siam acquired *Strongyloides*, often associated with a hookworm infection. Gentian violet in enteric capsules, 1.0 gr. twice daily for at least three weeks, gave the best results. Periodic urticarial or petechial attacks persisted in some patients for over three years. The obscure nature of these eruptions is discussed: they may be due to penetration of the skin by rhabditoid larvae, to exo-auto-infection of the skin, to endo-auto-infection within the alimentary canal, or be allergic in origin. R.T.L.

(26f) The stools of 79,078 persons (33,166 Europeans, 40,503 Africans and 5,409 Asians) in the Nairobi district were examined for helminth eggs during a period of seven years (1938 to 1944). The details are tabulated. *Taenia saginata* occurred in 0.3% of the Europeans, 17.1% of the Africans and 1.3% of the Asians. *T. solium* was not observed. *Ascaris lumbricoides* occurred in 0.3%, 8.2% and 1.4% respectively; hookworm (chiefly *Necator*) in 0.5%, 9.7% and 1.4%; *Schistosoma mansoni* in 0.6%, 2.3% and 1.2%; *Enterobius vermicularis* in 0.2%, 0.5% and 0.6%; *Trichuris trichiura* in 1.1%, 6.2% and 5.0%; *Hymenolepis nana* in 0.02%, 0.2% and 0.4%; *Trichostrongylus colubriformis* in 0.2%, 1.2% and 0.4%; *Strongyloides stercoralis* larvae in 0.2%, 5.2% and 0.7% and *S. stercoralis* eggs in 0.2%, 5.1% and 0.8% respectively. The chief vector of *S. mansoni* is *Biomphalaria (Planorbis) pfeifferi*, with *Bulinus tropicus* in some of the lower-lying districts. The periodic heavy flooding is the main controlling factor for *B. pfeifferi*. Increases in the number of cases occur in years of drought or low rainfall. R.T.L.

(26g) *Schistosoma haematobium* eggs were found in the urine of young healthy Africans passed for military service from the following tribes: KENYA—tribe Jalu 10%; UGANDA—tribes Lango 3%, Samia 2.6%, Nyoro 2%; TANGANYIKA—tribes Makua 18.7%,

Hehé 5·3%, Mwera 30·3%, Mwkuma 12·5%, Nyakusya 10%, Ngurimi 16·6%, Digo 19%, Nyamwezi 2·4%, Rufigi 10% ; NYASALAND—tribes Ngoni 14%, Yao 24%, Chewa 16%, Nyawja 13·9%, Nguru 16·5%, Amapatola 13%, Kokula 6·2%, Tumbuka 2·3% ; NORTHERN RHODESIA—tribes Chewa 39%, Tumbuka 51%, Womba 7·5%, Benga 15%, Chikunda 16%, Hgoni 12%, Nisa 14%, Njanga 10%, Lungu 20%, Tonga 14%, Kawehdi 11%. R.T.L.

27—Lancet.

- a. LEHMANN, H., 1949.—“Macrocytic anaemia in Central Africans in relation to ancylostomiasis and other diseases.” Year 1949, 1 (6542), 90-95.

(27a) In Central Africa severe anaemia is due to extra-vascular blood loss, and in 32 out of 44 patients was due to hookworms. There was an iron deficiency. Removal of the hookworms led to darkening of the skin in patients whose iron deficiency had been corrected, and other “kwashiorkor” symptoms disappeared. Tests in which tyrosine was injected into the skin supported the view that the pallor of the skin was due to inhibition by the parasites of tyrosine oxidation. R.T.L.

28—Medicina. Revista Mexicana.

- a. MAZZOTTI, L., 1949.—“Estudio acerca del tratamiento de la oncocercosis.” 29 (571), 1-5.
b. NETTEL F., R., 1949.—“Contribución al estudio de las condiciones naturales de las zonas de oncocercosis en Chiapas.” 29 (572), 21-32. [English summary p. 31.]

(28a) Thirty-six of 65 onchocerciasis patients treated orally with Hetrazan, 4 mg. per kg. body-weight three times daily for seven days, were observed during the following 1-14 months. There was a notable decrease of cutaneous microfilariae, but these tended to reappear in diminished numbers 4-8 months after treatment, especially in cases where nodules were not removed surgically. Ocular microfilariae and ocular symptoms disappeared a few days after treatment. Allergic reactions to the drug were less pronounced than in Bancroftian filariasis. E.M.S.

(28b) In the settlement of Santa Rita Coronado, situated 1,300 metres above sea level in Chiapas, 65% of the inhabitants have *Onchocerca volvulus*. From a study of 11,657 simuliids collected under standardized conditions from 7 a.m. to 8 a.m. and from 4 p.m. to 5 p.m. daily during the rainy season (April to September), Nettel F. found that 88·32% were *Simulium ochraceum*, 3·24% *S. metallicum* and 8·43% *S. callidum*. E.M.S.

29—Miscellaneous Publications. United States Department of Agriculture.

- a. RAMSEY, G. B., WIANT, J. S. & SMITH, M. A., 1949.—“Market diseases of fruits and vegetables: potatoes.” No. 98, revised edit., 60 pp.

(29a) The authors include brief accounts of infestations set up in potatoes by three nematodes, viz., the golden nematode, *Heterodera rostochiensis*; the potato rot nematode, *Ditylenchus destructor*; and the root-knot nematode, *H. marioni*. Symptoms of disease and methods of spread are mentioned and the chief means of control in each case are indicated. In the case of root-knot it is stated that there may be as many as 10-12 generations of the parasite per year in warm regions. T.G.

30—N. A. A. S. Quarterly Review. London.

- a. COHEN, M., 1949.—“Potato root eelworm in the Northern Province.” 1 (3), 143-145.

(30a) Potato root eelworm is now reported from farms in the counties of Durham, Northumberland and Cumberland; with one exception the infestations were not of recent origin. In Durham the main infected area is a triangle of six square miles, based on three miles of coast at Ryhope and extending inwards for four miles to west of Herrington, in the Sunderland-Seaham coastal strip of light soil where potatoes have been intensively cultivated

for a long period. Eelworm infection was also found in six fields in the south of the county of Northumberland and in two fields in Cumberland. It is stated that potatoes may probably be safely grown once in four years in the lightly infested fields if adequate amounts of farmyard manure and artificials are used. Attention is drawn to the danger of growing Brassica plants in infested fields, as cysts in soil attached to the roots may be transferred to clean land.

R.T.L.

31—Nature. London.

- a. EALES, N. B., 1949.—[*Acanthocephalus ranae*.] 163 (4135), 166.

(31a) Under the heading "Announcements" a fourth record of the occurrence of *Acanthocephalus* [= *Echinorhynchus*] *ranae* in Britain is made by Miss Eales who has collected specimens from local frogs at Reading.

E.M.S.

32—New Zealand Journal of Agriculture.

- a. MARSHALL, D., 1949.—"Avoiding losses in calves after weaning." 78 (2), 133, 135-136.

33—North American Veterinarian.

- a. TINER, J. D. & CHIN, T. H., 1949.—"The occurrence of *Trichuris globulosa* (Nematoda: Trichuroidea) in China." 30 (2), 97.
 b. OTTO, G. F., 1949.—"Heartworm in dogs." 30 (3), 181-189.
 c. MOSS, L. C., 1949.—"Anesthesia in filaria-infested dog." [Questions & Answers.] 30 (4), 260.

(33a) *Trichuris globulosa* and *T. ovis* occurred together in the caecum of a goat at Kweiyang. This is the first record of the occurrence of *T. globulosa* in China.

R.T.L.

(33b) Otto suggests that more reliable information is needed about the distribution, transmission, epizootology, curative treatment and control of *Dirofilaria immitis* infection in dogs in the U.S.A. In reviewing the subject he cites 44 references.

P.L.Ler.

34—Parasitology.

- a. FASTIER, L. B., 1949.—"The effect of physical agents on hydatid scolex viability." 39 (3/4), 157-163.
 b. VAN CLEAVE, H. J., 1949.—"*Pseudoporrorchis teliger*, a new species of Acanthocephala from Java." 39 (3/4), 214-217.
 c. DOUGHERTY, E. C., 1949.—"A list of the trichostrongylid lungworms (Phylum Nematoda) and a key to the six genera." 39 (3/4), 218-221.
 d. DOUGHERTY, E. C., 1949.—"The phylogeny of the nematode family Metastrongylidae Leiper, [1909]: a correlation of host and symbiote evolution." 39 (3/4), 222-234.
 e. ROGERS, W. P. & LAZARUS, M., 1949.—"The uptake of radioactive phosphorus from host tissues and fluids by nematode parasites." 39 (3/4), 245-250.
 f. GERICHTER, C. B., 1949.—"Studies on the nematodes parasitic in the lungs of Felidae in Palestine." 39 (3/4), 251-262.
 g. CROFTON, H. D., 1949.—"The ecology of immature phases of trichostrongyle nematodes. III. Larval populations on hill pastures." 39 (3/4), 274-280.
 h. TRIM, A. R., 1949.—"The kinetics of the penetration of some representative anthelmintics and related compounds into *Ascaris lumbricoides* var. *suis*." 39 (3/4), 281-290.
 i. CHANCE, M. R. A. & DIRNHUBER, P., 1949.—"The water-soluble vitamins of parasitic worms." 39 (3/4), 300-301.
 j. ROGERS, W. P. & LAZARUS, M., 1949.—"Glycolysis and related phosphorus metabolism in parasitic nematodes." 39 (3/4), 302-314.

(34a) Viable and non-viable hydatid scolices can be distinguished microscopically by a combination of sub-stage heating and supra-vital staining. Scolices are killed by exposure at 50°C. for 70 minutes and at 55°C. for 30 minutes. When infected liver was added directly to boiling water, scolices were destroyed after boiling for 40 minutes but when the infected liver in cold water was brought to the boil, subsequent boiling for 30 minutes was sufficient to kill the scolices. Although ultra-violet irradiations of 2537 Å. do not kill scolices, it might prove a simple method for the initial sterilization of scolex culture media.

R.T.L.

(34b) *Pseudoporrorchis teliger* n.sp. described from *Herpestes javanicus* and *Felis minutus javanicus* is the sixth species of this genus and the first to be recorded from mammalian hosts. It is most nearly related to *P. houdemeri* but many of the proboscis hooks are larger and the embryos are considerably smaller. R.T.L.

(34c) Dougherty has transferred the six genera *Crenosoma*, *Bronchostrongylus*, *Ostrostrongylus*, *Troglostrongylus*, *Skrjabinogylus* and *Dictyocaulus*, which form the *Skrjabinogylinae*, from *Metastrongylidae* to *Trichostrongylidae*. Their 21 species and the type host of each are listed. A key to the genera is based on male characters. *Troglostrongylus delicatus* is transferred to *Bronchostrongylus*. R.T.L.

(34d) Dougherty discusses the probable origins of the *Metastrongylidae*. Morphological and biological evidence is given that these comprise three main lines, each characteristic of a placentate order, viz., *Filaroidinae* in *Carnivora*, *Pseudaliinae* in *Cetacea* and *Protostrongylinae* in *Artiodactyla*. Diagnoses are given for the family *Metastrongylidae* and its four sub-families with lists of component genera. *Neometastrongylus* is made synonymous with *Neostrongylus*, and *Otophocaenurus* with *Pharurus*. *Neometastrongylus buechii* is a synonym of *Neostrongylus linearis*. *Otophocaenurus oserskoi* becomes *Pharurus oserskaiaae* and *Metathelazia massino* is emended to *M. massinoi*. R.T.L.

(34e) *Ascaris lumbricoides* takes up inorganic orthophosphate chiefly through the alimentary canal. *Nippostrongylus muris* takes up radioactive phosphorus when this is injected intramuscularly into its host, but when given orally it appears in the parasites at a lower concentration than in the host's intestine. There was a sudden rise and fall in the radioactivity of *Ascaridia galli* when host birds were dosed orally with inorganic orthophosphate containing P^{32} , but there was none when this was intravenously injected. It is suggested that parasitic nematodes have a high demand for phosphate. *A. galli* feeds on the gut contents, but there is poor phosphate absorption. *N. muris* feeds on host tissues. This difference in feeding habits may explain the relative efficacy of anthelmintics for these parasites. R.T.L.

(34f) Three lungworms are described from Palestine: *Aelurostrongylus abstrusus* (Railliet, 1898) and *Anafilaroides rostratus* n.g., n.sp., from domestic cats, and *Troglostrongylus brevior* n.sp. from the bronchi of *Felis ocreata* and *Catolynx chaus*. In Jerusalem 26% of 73 stray cats were found to be infected with *A. abstrusus*. The life-cycles of *A. abstrusus* and *T. brevior* have been followed experimentally in the land molluscs *Chondrula septemdentata*, *Helicella barbesiana*, *H. vestalis joppensis*, *Monacha syriaca*, *Retinella nitellina*, *Theba pisana* and *Limax flavus* and adults have been produced in experimentally fed kittens. Additional intermediaries for *A. abstrusus* are *Helix cavata*, *Levantina cesareana*, *L. hierosolyma* and *Agriolimax* sp. *Anafilaroides* is differentiated from *Filaroides* by the straight spicules and the position of the vulva and anus close to one another near the rounded end of the body. The taxonomic position of *Troglostrongylus* and *Aelurostrongylus* is discussed. Gerichter does not agree with Dougherty's proposal to transfer six of the genera of *Metastrongylidae* to *Trichostrongylidae* [see above, No. 34c]. He points out that they conform to the *Protostrongylinae* in larval form, life-histories, pattern of circumoral papillae and reduction of the dorsal ray. R.T.L.

(34g) Crofton shows that controlled grazing on hill pastures reduces the number of trichostrongyle parasites on the grazed portions by limiting the extent of faecal contamination, and that where there is uneven grazing a local concentration of infective larvae occurs on the grazed portions. The number of larvae fluctuates on grass blades throughout the day, being lowest when dew is formed, and highest between midday and 5 p.m. The number of larvae on a pasture reaches its maximum in August. The larval population may be reduced by 55% as a result of resting a pasture for three weeks, while a week after the return of the sheep the reduction was 90%. Even a rest of two weeks may reduce the number of larvae

considerably. As a great increase in the nutritional value of herbage may induce overcrowding a policy of improvement by producing a more uniform grazing is more practical than one which raises the nutritional value of all the herbage. R.T.

(34h) An analysis of the results of experiments with phenolic substances, nicotine and chloroform on their rate of penetration of fresh specimens of *Ascaris lumbricoides* var. *suis* Baldwin's isotonic saline at 37°C. shows that the outermost layer of the cuticle of *Ascaris* is probably the main barrier. It acts like a thin homogeneous layer of lipid. The rate of penetration of *l*-nicotine is slow and is greatly influenced by the extent of dissociation of its methyl pyrrolidine basic group. The presence of some surface-active substances greatly accelerates it. Chloroform penetrates very rapidly, uninfluenced by proteins, carbohydrates and fats. R.T.

(34i) The members of the vitamin B complex in *Fasciola hepatica*, *Nippostrongylus muris*, *Ascaris lumbricoides* and *Moniezia benedeni* have been ascertained. The amounts in μ gm./gm. dry weight of whole worms are tabulated under aneurin [thiamine], nicotinic acid, pantothenic acid, pyridoxine and riboflavin. All these were present in quantities comparable with those found in the tissues of higher animals and it is therefore a reasonable assumption that they are required by the parasites. R.T.

(34j) Rogers & Lazarus have studied the fermentation of glycogen to lactate in preparations obtained from *Ascaris lumbricoides*, *Nematodirus* spp. and *Ascaridia galli*, by examining the enzymic utilization and formation of substrates, the action of inhibitors, and by the analysis of resting tissues for phosphorylated intermediaries. Glucose 1-phosphate was utilized for glycogen formation. Fructose 1:6-diphosphate was metabolized most rapidly in the presence of diphosphopyridine nucleotide and pyruvate. Incubation in the presence of fluoride led to the formation of glucose 6-phosphate, fructose 6-phosphate and adenosine triphosphate; although acid-unstable phosphorus was formed, no creatine or arginine-phosphate was found. From this and other evidence the authors conclude that carbohydrate fermentation in nematode parasites is similar, in general, to that in yeast and mammalian muscle and that energy in the parasites' tissues is transferred by means of high energy phosphate bonds. Phospholipoids, which were found in considerable amounts in the tissues of *A. lumbricoides*, were estimated as lecithin, sphingomyelin and serine- and ethanolamine-containing phospholipoids. The amounts of the phospholipoids found in the parasite tissues are compared with figures given for other organisms. W.P.

35—Phytopathology.

- †a. CLAYTON, E. E., GAINES, J. G., GRAHAM, T. W. & TODD, F. A., 1949.—"Soil treatment with chemicals for the control of tobacco parasites." 39 (1), 4-5.
- †b. CRALLEY, E. M., 1949.—"White tip of rice." 39 (1), 5.
- †c. GRAHAM, T. W., 1949.—"Nematode root rot of tobacco and other crops." 39 (1), 8.
- †d. KINCAID, R. R. & VOLK, G. M., 1949.—"Soil fumigation for cigar-wrapper tobacco in Florida." 39 (1), 11.
- †e. TARJAN, A. C., 1949.—"Utilization of the Baermann method as a means of assay of root infection by meadow nematodes, *Pratylenchus* spp." 39 (1), 24.
- f. MCCLELLAN, W. D., CHRISTIE, J. R. & HORN, N. L., 1949.—"Efficacy of soil fumigants as affected by soil temperature and moisture." 39 (4), 272-283.

(35a) In the control of weeds, fungi and eelworms (root-knot and *Pratylenchus* spp.) in tobacco soils, Clayton et al. state that the following materials are promising: calcium or potassium nitrite at 1 lb. per sq. yard, sodium azide at 4 oz. per sq. yard, mixtures of calcium cyanamide and sodium azide, mixtures of allyl alcohol and ethylene dibromide, D-I mixture, ethylene dibromide. Heavy reinfestation occurred by the end of the current crop year [it is not clear whether this applied to all the listed materials], but in bad eelworm soil up to 50% increases in the yield of cured leaf resulted. B.G.P.

† Abstracts of papers presented at the 40th Annual Meeting of the American Phytopathological Society, Pittsburgh, December 6-8, 1948.

(35b) "White tip" is an important disease of rice in the U.S.A. recently shown to be caused by a nematode. The symptoms are very similar to those observed by Cralley in Japan and caused by *Aphelenchoides oryzae* Yokoo. Viable nematodes were found on rice seed eight months after harvest. Hot-water treatment of the seed for 15 minutes at 52°-53°C. reduced infection from 75% to less than 1% in greenhouse tests. Losses in the field have been reduced by early planting (April) and by growing resistant varieties such as Fortuna, Nira and Bluebonnet. M.T.F.

(35c) In the coastal plain area of the U.S.A. tobacco suffers from root-rot caused by nematodes, *Pratylenchus* spp. In South Carolina the roots of plants transplanted in early May show invasion of nematodes one month later. Maximum nematode populations occur in the roots from late July to early August but by mid-August the numbers decline and this coincides with a rapid build-up of the nematodes in the roots of crab grass, which is a common weed in tobacco fields in late summer and early autumn. Tobacco roots infested with *Pratylenchus* spp. decay more rapidly than those of certain other host plants and an estimate of the numbers of nematodes in equal weights of roots gave the following comparative figures: tobacco 1.0, cotton 0.7, crab grass 2.3, maize 18.7. When tobacco is grown after maize it often shows severe root-rot. T.G.

(35d) Kincaid & Volk have compared the nematocidal effects of 40% ethylene dibromide at 15 gal. per acre and D-D mixture at 23 gal. per acre, fumigating plots in triplicate on each of three dates (29th September, 3rd December, 5th February), and transplanting tobacco into all plots on the 25th March. Better results were got (i) from the earliest fumigation, (ii) from D-D, (iii) against root-knot rather than root-rot eelworms. Fumigation prolonged the retention of ammonia nitrogen in the soil, and the effect of this on the plants must be differentiated from nematocidal effects. B.G.P.

(35e) In order to arrive at an estimate of the numbers of meadow nematodes in boxwood roots, Tarjan soaked standardized weights of infested roots in Baermann funnels, and found that the nematodes emerged from the tissues for as long as nine weeks. He found that about $19.4 \pm 1.1\%$ emerged during the first day and that $95.4 \pm 3.5\%$ had escaped from roots by the end of three weeks. Water was drawn off and examined for nematodes three times weekly. T.G.

(35f) McClellan et al. have tested the lethal effects of chloropicrin, D-D mixture, 10% methyl bromide, and 15% ethylene dibromide against *Heterodera marioni*, a *Fusarium* and a *Sclerotium* at two moisture and six temperature levels in a greenhouse. Of each fumigant 2.5 ml. was injected 3 inches deep in the middle of a tin holding 46½ lb. of air-dry soil. Moisture levels were held at 7-10% and 17-20%, and temperatures at 10° intervals from 45°F. Inocula were buried in cheesecloth bags 7½ inches from the injection point and removed after 1, 3, 6, 9 and 13 days. Regarding only root-knot, chloropicrin was fully effective only at the highest temperature. D-D was effective after three days at temperatures above 55°F. Methyl bromide was only slightly effective. Ethylene dibromide was effective in one day at the highest, and after three days at all temperatures. All fumigants were more effective in wet soils and were retained longest in wet soils at low temperatures. B.G.P.

36—Plant Disease Reporter.

- a. LARGE, J. R., 1949.—"Parasitic diseases of tung." 33 (1), 22-30.
- b. FENNE, S. B., 1949.—"Tobacco diseases in Virginia, 1948." 33 (2), 75-76.
- c. FENNE, S. B., 1949.—"Small grain diseases in Virginia in 1948." 33 (2), 80.
- d. FENNE, S. B., 1949.—"Alfalfa and soybean diseases in Virginia, 1948." 33 (2), 90-91.
- e. CHITWOOD, B. G., 1949.—"Cyst-forming *Heterodera* encountered in soil sampling." 33 (3), 130-131.
- f. VIGGARS, R. M. & TARJAN, A. C., 1949.—"A new root disease of pin oaks possibly caused by the nematode, *Hoplolaimus coronatus* Cobb." 33 (3), 132-133.

(36a) Among the various diseases of tung trees in the U.S.A. dealt with in this paper, brief mention is made of root-knot caused by *Heterodera marioni*. Large says that this may

cause weakening and stunting to nursery stock in the first year, and that infested trees are more susceptible to winter injury than healthy trees. Such trees usually outgrow the infestation when planted in the orchard. To prevent infestation the tung nursery should be planted on clean land, on old grass pasture land or land that has been cropped with rotational crops such as *Crotalaria*s, peanuts and velvet beans which tend to reduce the root-knot population.

T.G.

(36b) Fenne reports that root-knot (*Heterodera marioni*) on tobacco was more prevalent in 1948 than for several years past. Many growers sent in root-knot-infested roots.

T.G.

(36c) Fenne mentions the occurrence of the wheat-gall nematode, *Anguina* [= *Anguillulina*] *tritici*, throughout the wheat-growing area of Virginia, especially on small farms where home-grown seed is used year after year without special cleaning.

T.G.

(36d) Fenne mentions the occurrence of stem eelworm disease caused by *Ditylenchus* sp. [most probably *D.* (= *Anguillulina*) *dipsaci*] on a farm in Henrico Co., Virginia. This is apparently the first record of stem eelworm on alfalfa in Virginia, and it is not known to what extent it occurs within the State or how serious it might prove there.

T.G.

(36e) During routine examination of soil samples from potato fields in eastern and mid-western parts of the U.S.A. *Heterodera punctata* was found, for the first time in the U.S.A., in North Dakota. An apparently new species of *Heterodera* with lemon-shaped cysts, also from North Dakota, differs from the polygonum *Heterodera* in that the egg shell is minutely speckled and the stylet rather larger: the host is unknown. *H. rostochiensis* was found in the soil about the roots of a *Cyclamen* sp. imported from Germany and was destroyed.

M.T.F.

(36f) Viggars & Tarjan describe disease symptoms with associated chlorosis and hypersensitivity to drought in pin oaks (*Quercus palustris*) and to a lesser extent in red oaks (*Q. rubra*) at Wilmington, Delaware. There is widespread destruction of root hairs and fibrous roots. On examining the roots of a tree which had almost died but had recovered on the addition to the soil of large quantities of organic matter, the nematode *Hoplolaimus coronatus* was found as well as *Pratylenchus pratensis*. Of a further 20 affected seedlings *H. coronatus* was found associated with 18, and it was thought that these two nematodes may possibly be associated with the trouble as causal organisms or be closely related with it.

T.G.

37—Plant Disease Reporter. Supplement.

a. ANON., 1949.—“Results with soil sterilization and fumigation.” No. 181, pp. 77–80.

(37a) In tests carried out during 1948, various increases in crop production resulted from tests with soil fumigants against root-knot, *Heterodera marioni*, in carrots (New York), cucumber (South Carolina), green beans (North Carolina), peas and tomatoes (Florida), against root-knot and meadow nematode in tobacco (Florida, Georgia and South Carolina), and sugar-beet nematode in Utah. The chemicals used were D-D, Dowfume W-10, Dowfume W-40, Soilfume 80-20, chloropicrin, methyl bromide and ethylene dibromide mixtures. Temporary reduction in numbers of nematodes, not their elimination, is considered to be the profitable objective.

R.T.L.

38—Proceedings of the Helminthological Society of Washington.

- a. ALLEN, R. W. & SPINDLER, L. A., 1949.—"Note on the natural occurrence in farm-raised chickens of encysted third stage larvae of *Physocephalus sexalatus*, a spirurid stomach worm of swine." 16 (1), 1-3.
- b. BUHRER, E. M., 1949.—"Technique for the beheading and *en face* examination of nematodes and similar animal types." 16 (1), 3-6.
- c. CHITWOOD, B. G., 1949.—"Ring nematodes (Criconematinae). A possible factor in decline and replanting problems of peach orchards." 16 (1), 6-7.
- d. DENTON, J. F. & RAUSCH, R., 1949.—"The occurrence of *Platynosomum illiciens* (Braun, 1901) in a North American hawk." 16 (1), 7-9.
- e. DIKMANS, G. & GOLDBERG, A., 1949.—"A note on *Arthrocephalus lotoris* (Schwartz, 1925) Chandler, 1942 and other roundworm parasites of the skunk, *Mephitis mephitis*." 16 (1), 9-11.
- f. ENZIE, F. D., 1949.—"The ascaricidal action of reduced dosages of sodium fluoride in swine and the influence of various concentrations of the chemical on feed consumption." 16 (1), 11-16.
- g. GARDINER, J. L. & WEHR, E. E., 1949.—"Some parasites of the wild turkey (*Meleagris gallopavo silvestris*) in Maryland." 16 (1), 16-19.
- h. MAYHEW, R. L., 1949.—"Studies on bovine gastro-intestinal parasites. XIV. *Haemonchus contortus* immunity experiments with injections of dried worm powder and immune blood serum." 16 (1), 19-23.
- i. RAUSCH, R. & SCHILLER, E. L., 1949.—"Some observations on cestodes of the genus *Paranoplocephala* Luehe, parasitic in North American voles (*Microtus* spp.)." 16 (1), 23-31.
- j. VAN CLEAVE, H. J., 1949.—"An instance of duplication of the cement glands in an acanthocephalan." 16 (1), 35-36.

(38a) Allen & Spindler report the discovery of third-stage larvae of *Physocephalus sexalatus*, a stomach worm of swine, encysted in the wall of the crop of 6.4% of farm-reared fowls. These larvae developed to maturity when fed to pigs. It is suggested that farm-reared and garbage-fed pigs may become infected from eating the discarded viscera of fowls dressed for human consumption. R.T.L.

(38b) Buhrer gives a detailed account of the various steps by which end-on views of nematodes may be obtained. The method is based on Cobb's technique, modified by Chitwood & Wehr, and further refinements are introduced. R.T.L.

(38c) Chitwood has obtained large numbers of *Criconemoides simile* (Cobb, 1918) n.comb. from small lesions on the roots of peach trees near Salisbury, Maryland. It is suspected that they may play a part in peach orchard decline. Root-knot nematodes were absent. R.T.L.

(38d) *Platynosomum illiciens*, hitherto thought to be restricted to Brazil, has been found in the bile-ducts of two *Buteo platypterus* collected in Ohio and Wisconsin. The material is described and figured. R.T.L.

(38e) An examination of specimens of *Arthrocephalus lotoris* from skunks revealed the presence of a pair of obtuse ventral lancets in the buccal cavity, thus differentiating these worms from *A. gambiensis* and *A. maxillaris*. The spicules of *A. lotoris* measure 0.7-0.8 mm., those of *A. gambiensis* 0.36 mm. and those of *A. maxillaris* 0.85 mm. in length. Other nematodes present were *Skrjabinigylus chitwoodorum*, *Physaloptera maxillaris*, *Ascaris columnaris*, *Molineus patens* and *Capillaria* sp. R.T.L.

(38f) Enzie presents data on the efficacy of feed mixtures containing less than 1% sodium fluoride in the treatment of *Ascaris lumbricoides* in pigs, and on the effect of various concentrations of this chemical on food consumption. While a 0.75% mixture was not significantly more palatable than 1% it removed 97% of the worms and increased the safety margin, but did not warrant change in the accepted dosage of 1%. R.T.L.

(38g) Unthriftiness in a flock of wild turkeys at Hancock, Maryland, is attributed to the presence of large numbers of helminths. The species present were *Raillietina cesticillus*, *R. williamsi*, *Davainea meleagridis*, *Trichostrongylus tenuis*, immature *Ascaridia* presumed to be *A. dissimilis*, and *Capillaria longicollis*. Sanitation is the most practical measure of control of these infections. R.T.L.

(38h) No protection against *Haemonchus contortus* was afforded to three non-immune calves either by the subcutaneous injection of powdered *H. contortus* adults suspended in 15-20 c.c. of physiological saline, or by injecting into the jugular vein blood serum obtained from a calf that had been shown to be immune. R.T.L.

(38i) As the *Paranoplocephala* spp. parasitic in North American voles of the genus *Microtus* required taxonomic clarification Rausch & Schiller, after critically reviewing the literature, have given descriptions, illustrations and a key for the species *P. infrequens*, *P. variabilis* and *P. borealis* n.comb. A description is given of an unnamed species closely resembling *P. infrequens*. R.T.L.

(38j) Van Cleave records the complete duplication of the cement glands in a single specimen out of several hundred *Echinorhynchus gadi*. There were 12 glands instead of the normal six. R.T.L.

39—Publications de l'Institut Belge pour l'Amélioration de la Betterave.

- a. SIMON, M., 1949.—"La lutte contre le nématode de la betterave par la désinfection du sol." 17 (2), 15-25. [English & Flemish summaries p. 24.]

(39a) Simon has tested a number of soil fumigants for their effects on sugar-beet and on *Heterodera schachtii* larvae. The following substances were injected in spring, 18 cm. deep, on replicated areas of 54 sq. metres: Shell D-D at 400 and 800 kg. per hectare; Dowfumes N and W40 at 400 kg. per hectare; Iscobrome-D at 300 and 600 litres per hectare; orthodichlorobenzene, tetrachlorethane, trichlorethylene, and "Sambroline" (chloronaphthalenes) at 500 and 1,000 litres per hectare. Beet seed was planted 15 days after injection. In terms of yield of roots, tops and sugar the best results came from D-D and Dowfume-N at 400 kg. per hectare. D-D at 800 kg. per hectare led to a higher kill of eelworm larvae, 82% as against 75%, but was phytotoxic and produced distorted roots in clay soils. None of the other fumigants was effective, and none at all controlled fungi. B.G.P.

40—Science.

- a. ULMER, M. J., 1949.—"Life cycle of *Postharmostomum laruei* McIntosh 1934 (Trematoda: Brachylaemidae)." 109 (2819), 13-14.
b. ROBINSON, Jr., E. J., 1949.—"Notes on the life history of a brachylaemid trematode." 109 (2820), 32.

(40a) The metacercariae of *Postharmostomum laruei* are found in the pericardial cavity of slugs and of the land snails *Anguispira alternata*, *Polygyra thyroides*, *P. profunda*, *P. multilineata*, *P. fraudulenta*, *P. hirsuta*, *Gastrodonta ligera* and *Zonitoides arboreus* in the neighbourhood of Ann Arbor, Michigan. Adults were experimentally developed in laboratory-reared *Peromyscus maniculatus*. R.T.L.

(40b) Adult brachylaemid trematodes, which are described but not yet identified, were recovered from white mice and *Peromyscus leucopus* experimentally infected with cercariae possibly identical with those named by Leidy *Distoma helici* in 1847 and *D. vagans* in 1850. The cercariae develop in branched sporocysts in *Anguispira alternata*. R.T.L.

41—Scottish Agriculture.

- a. JAMIESON, S., 1949.—"Black disease of sheep. Its nature, importance and prevention." 28 (3), 155-161.

(41a) Jamieson deals with the geographical distribution, seasonal incidence, clinical symptoms, pathological lesions, epizootology and prevention of "black disease" in Caithness, Scotland. The invasion of the liver by immature liver-flukes is claimed to stimulate dormant spores of *Clostridium oedematiens*, already present in the liver, into active reproduction.

The essential differences between this disease, acute fascioliasis and braxy are tabulated. For the prevention of "black disease" he recommends vaccination, proper disposal of carcasses, and liver-fluke eradication by medication of sheep with carbon tetrachloride and of cattle with hexachlorethane. *Limnaea truncatula* can be controlled by drainage and the application of copper sulphate at the rate of 20 lb. per acre. P.L.IER.

42—Southern Medical Journal.

- a. OLIVER-GONZALEZ, J., SANTIAGO-STEVENSON, D. & HEWITT, R. I., 1949.—"Treatment of six cases of ascariasis in man with 1-diethylcarbamy-4-methylpiperazine hydrochloride." 42 (1), 65-66.

(42a) Hetrazan, in doses of 2 mg. per kg. given orally at 8-hourly intervals for 24 hours to six patients infected with *Ascaris lumbricoides*, resulted in the complete removal of all the worms from three patients and in a reduction of egg counts by 83.4%, 91.3% and 99.5% in the remaining three cases. All the worms evacuated were alive. There were no toxic effects. R.T.L.

43—Transactions of the Royal Society of Tropical Medicine and Hygiene.

- a. GORDON, R. M., CHWATT, L. J. & JONES, C. M., 1949.—"1. The breeding places of *Chrysops* in the British Cameroons. 2. The infection rate with *Loa loa* in the fly population, and in the human population at Kumba, British Cameroons." [Demonstration.] 42 (4), 315-316.
- b. KERSHAW, W. E., 1949.—"Some observations on *Litomosoides carinii* (Travassos, 1919) Chandler, 1931. (1) Development of the first stage larva." [Demonstration.] 42 (4), 318.
- c. BERTRAM, D. S., 1949.—"A method of inducing controlled infection with *Litomosoides carinii* in the cotton rat." [Demonstration.] 42 (4), 318-319.
- d. KERSHAW, W. E., BERTRAM, D. S. & WILLIAMSON, J., 1949.—"The chemoprophylaxis of filariasis in the cotton rat." [Demonstration.] 42 (4), 319.
- e. BERTRAM, D. S., KERSHAW, W. E. & WILLIAMSON, J., 1949.—"The course of untreated infections of *Litomosoides carinii* in the cotton rat and the application of the observations made to chemotherapeutic trial." [Demonstration.] 42 (4), 319-320.
- f. ROBERTS, E. W., 1949.—"Slide showing the miracidia of *Fasciola hepatica* in the foot and mantle of *Limnaea truncatula*, one hour after exposure to infection." [Demonstration.] 42 (4), 320.
- g. BLAIR, D., 1949.—"Series of 28 photographs on schistosomiasis in Southern Rhodesia." [Demonstration.] 42 (4), 322.
- h. CANNON, D. A., 1949.—"Eggs of *Paragonimus* in sputum of patient in the Cameroons." [Demonstration.] 42 (4), 322.
- i. CRUSZ, H., 1949.—"1. Slides and photomicrographs illustrating the larval development of *Taenia taeniaeformis* (*Cysticercus fasciolaris*) in the liver of infected rats. 2. Slides illustrating the process of transverse fission of *Cysticercus pisiformis* in experimentally infected rabbits. 3. Slide and photographs illustrating the difference in optical properties between blade and base of the rostellar hooks of taeniid cestodes (*Taenia serialis* and *T. taeniaeformis*), when examined in polarized light." [Demonstration.] 42 (4), 322-323.
- j. BAYLIS, H. A., MANSON-BAHR, P. & BUCKLEY, J. J. C., 1949.—"Demonstration of a cestode new in man—*Inermicapsifer arvicanthidis* (Kofend, 1917)—a parasite of rats in Kenya." [Demonstration.] 42 (4), 323-324.
- k. WHITE, T. H., 1949.—"Lymphostatic verrucosis." [Correspondence.] 42 (4), 410-411.
- l. ERFAN, M., ERFAN, H., MOUSA, A. M. & DEEB, A. A., 1949.—"Chronic pulmonary schistosomiasis: a clinical and radiological study." 42 (5), 477-485.
- m. NAGATY, H. F. & ZANATY, A. F., 1949.—"The treatment of polycythaemia vera. A record of one case treated with *Ancylostoma* infection." 42 (5), 493-499.
- n. KOENIGSTEIN, R. P., 1949.—"Observations on the epidemiology of infections with *Clonorchis sinensis*." 42 (5), 503-506.

(43a) The breeding places of *Chrysops* at Kumba, British Cameroons were found in densely shaded streams running along thickly overgrown ravines where slowly moving water passed over a layer of mud covered with decaying vegetation. The proportion of the population showing microfilariae of *Loa loa* was much lower than would have been expected from the *Chrysops* rate of infection. R.T.L.

(43b) The larvae of *Litomosoides carinii* shed their vitelline membrane at birth. In the pleura they are unsheathed. In the peripheral circulation the sheath can be seen easily in some, but with difficulty or not at all in others. The sheathed and unsheathed forms are morphologically identical. R.T.L.

(43c) A method, not described, was shown by which infections with *Litomosoides carinii* ranging from 11-86% were obtained in *Liponyssus bacoti*. If no gorged mites were recovered from a cotton-rat exposed to infective mites for 24 hours infection was unlikely to ensue, but if some were recovered the infection rate might reach 95%. R.T.L.

(43d) The intraperitoneal injection into cotton-rats of stilbamidine or antrypol failed to act as a prophylactic against experimental infection with *Litomosoides carinii*, but 8 out of 10 cotton-rats failed to develop microfilariae in the peripheral circulation after injection with "MSb" (Friedheim). R.T.L.

(43e) From a study of the course of an untreated infection with *Litomosoides carinii*, which showed a gradual fall in the number of microfilariae and their final disappearance in about eleven months, it is inferred that the only reliable period for chemotherapeutic trial is during the first 3-4 months after infection. Microfilariae survived about one month in transfused blood and the rate of fall was similar to that in spontaneous cure. R.T.L.

(43h) *Paragonimus* eggs were found in the sputum of a Cameroons patient with non-tuberculous chronic respiratory disease. R.T.L.

(43i) Transverse fission of *Cysticercus pisiformis* occasionally takes place and is usually completed in the liver. The anterior segment develops a scolex, the posterior is acephalic. In polarized light the blade of the taenioid hook is birefringent while the base is isotropic. R.T.L.

(43k) Two photographs illustrate a case of lymphostatic verrucosis on the legs and feet of an African seen at Muheza, Tanganyika. It is suggested that invasion by bilharzia cercariae may have been the cause of the condition. R.T.L.

(43n) A sudden outbreak of clonorchiasis of epidemic proportions which occurred in Shanghai in 1946 among European displaced persons was traced to pickled freshwater fish sold as "herrings". The clinical symptoms, which were those of an acute infection with an eosinophilia of 10-88%, coincided with invasion of the bile ducts by the metacercariae. Ova appeared in the faeces one month later. After a few weeks the acute phase subsided and the cases conformed with the classical description of clonorchiasis. The eosinophilia fell to 5-10%. There was a simultaneous increase in protozoal intestinal infections. Gentian violet was the only drug which alleviated the symptoms and temporarily reduced the number of eggs in the faeces. R.T.L.

44—University of Ceylon Review.

a. FERNANDO, W., 1949. —"Zoology in Ceylon." 7 (1), 1-11.

(44a) Fernando mentions two cases of human helminthic disease recorded in an ancient chronicle of Ceylon, the Culavamsa (circa 12th century A.D.). One case deals with worms which a bhikkhu had ingested as a result of having drunk contaminated milk. "In his belly the worms multiplied and fed in his bowels"; this was cured by the physician-king Buddhadasa (4th century A.D.), who caused the bhikkhu to vomit the worms by giving him horse's blood to drink. The other record refers to a man who had swallowed the egg of a "water-snake" and had thus become infested with the "snake" which "sucked itself fast in his inside". This too Fernando interprets as being an ancient description of a helminth infection. H.C.

45—Veterinary Medicine.

- a. OLSEN, O. W., 1949.—“ White-tailed deer as a reservoir host of the large American liver fluke.” 44 (1), 26-30.
- b. YARBOROUGH, J. H., 1949.—“ Disease and conditions of racing dogs.” 44 (2), 56-59.
- c. SINCLAIR, L. R., 1949.—“ Observations on liver flukes in cattle.” 44 (2), 68-69.
- d. DIMOCK, W. W., 1949.—“ The two-gram daily dose of phenothiazine for strongylosis of the horse.” 44 (3), 99-102.
- e. OLSEN, O. W., 1949.—“ Action of hexachloroethane-bentonite suspension on the rumen fluke, *Paramphistomum*.” 44 (3), 108-109.

(45a) Olsen reviews the literature dealing with the molluscan hosts of *Fascioloides magna* and its presence in North American deer. The records, except one, report the recovery from deer of *F. magna* only, even in areas where *Fasciola hepatica* was common in cattle. He recovered *F. magna* from 36 of 52 deer (*Odocoileus virginianus*) from Texas and describes the pathological lesions in deer and domestic ruminants. *Stagnicola bulimoides bulimoides*, the intermediary of *Fasciola hepatica*, is suspected to be an efficient vector also of *Fascioloides magna*. The transfer of infected deer to other regions for restocking purposes may establish new centres of fascioloidiasis in domestic ruminants. P.L.ler.

(45b) The diagnosis of *Dirofilaria immitis* infestation in dogs is described. Lungworm in racing dogs is not common. The symptoms resemble distemper. Treatment is outlined. R.T.L.

(45c) In the livers of cattle slaughtered at Duluth, Minnesota, *Fascioloides magna* occurred fairly frequently. As the eggs do not escape from cattle and the adults produce extensive and fatal hepatic lesions in sheep, it is suggested that these are not the normal hosts. The natural host is the deer. A table sets out the differences between the hepatic lesions produced by *F. magna* and by *Fasciola hepatica*. R.T.L.

(45d) Dimock recommends the daily incorporation of 2 gm. of phenothiazine, mixed with a palatable vehicle, in the food for the control of strongyles in horses. He refers to the toxicity of phenothiazine in stabled horses on a dry diet, low in protein and deficient in vitamin A. P.L.ler.

(45e) The author reports on the clinical symptoms and pathological lesions associated with acute paramphistomiasis, caused by the young parasites in the abomasum and duodenum in ruminants. He records that hexachlorethane-bentonite suspension expelled all the adult parasites from one cow and most of them from one sheep. The cow received three doses of 120 c.c. each on three consecutive days. The sheep had a single dose of 30 c.c. and died within 24 hours. P.L.ler.

46—Veterinary Record.

- a. leROUX, P. L., 1949.—“ Is cysticercosis bovis on the increase in this country ? ” 61 (8), 87.
- b. BLACK, N. M., 1949.—“ Sodium fluoride for roundworms in pigs.” [Correspondence.] 61 (9), 107-108.
- c. SHANKS, P. L., 1949.—[Sodium fluoride for roundworms in pigs.] [Correspondence.] 61 (9), 108.
- d. LUKE, D. & GORDON, W. A. M., 1949.—“ Sodium fluoride for round worm in pigs.” [Correspondence.] 61 (12), 157.

(46a) leRoux believes that there has been an increase in the incidence of taeniasis in man and of cystercerciasis in cattle in England within recent years. At present the incidence in cattle appears to be about 1%. Attention is drawn to the need for careful inspection of carcasses for *Cysticercus bovis*. P.L.ler.

(46b) Black draws attention to a serious omission in the N.V.M.A. handbook “ The Husbandry and Diseases of Pigs ” (November 1947), no mention being made of the correct concentration of sodium fluoride to be used in the treatment of roundworms in pigs. His

experience with this substance confirms that proper dosage based on age and weight, and at a concentration not above 1% of the dry feed is a safe, effective and economical method of treatment. P.L.LER.

(46c) Shanks, replying to Black's criticism [see No. 46b], admits that dosages had been omitted. He observes that the dosage rates, based on weight ranges, should be followed and the correct dose mixed in the amount of food which is normally consumed by the pig in one day. An appeal is made to veterinarians to publish their personal experiences with sodium fluoride for ascariasis in pigs. P.L.LER.

(46d) Luke & Gordon state that 1% of sodium fluoride in dry meal proved a reliable, safe and convenient anthelmintic for the removal of *Ascaris* in the pig. For pigs fed potatoes and swill, doses of 0.1 to 0.15 gm. were given. Intake of the medicated food was reduced by about 50% but no other food was offered until the medicated material had been consumed. No ill-effects were observed. P.L.LER.

NON-PERIODICAL LITERATURE

- 47—KRONENBERG, H. G., GERRITSEN, J. D., KLINKENBERG, C. H., ERKELENS, M. A. & ZWEEDE, A. K., 1949.—“De aardbei.” Zwolle: N.V. Uitgevers-Maatschappij—W. E. J. Tjeenk Willink, xii+327 pp.

This book, dealing with all aspects of the growth and cultivation of the strawberry, contains one chapter on diseases including those due to nematodes. The morphology and biology of *Aphelenchoides fragariae* and the symptoms caused by it are described and illustrated. Only indirect means of control, such as roguing and burning diseased plants and resting infected ground from strawberries for at least eight years, can be recommended. *Anguillulina dipsaci*, though less important, is often found in strawberries in Holland; this nematode and the symptoms caused by it are described. The meadow nematode, *Pratylenchus pratensis*, is also described; it has been found in strawberry roots both in small swellings and in unswollen roots of plants with root-rot symptoms. It is not certain whether or not it is a primary parasite of strawberries. M.T.F.

- 48—SCHWARTZ, B. & BURCH, D. S., 1949.—“Sodium fluoride effective against swine roundworms.” Research Achievement Sheet, Agricultural Research Administration, United States Department of Agriculture, No. 119(A), 2 pp.

- 49—WESTON, W. A. R. DILLON & STAPLEY, J. H., 1949.—“Diseases and pests of vegetables.” London: Longmans, Green & Co., 74 pp., 4/-.

The authors describe briefly the onion eelworm (*Anguillulina dipsaci*) and its effects on onions. They also mention potato root eelworm (*Heterodera rostochiensis*) as it affects potatoes and tomatoes, and root-knot eelworm (*H. marioni*) in greenhouse tomatoes. M.T.F.